ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were reported as follows: 2d, Farmington, Minn. 3d, Ilion, N. Y. 6th, Carson, Iowa. 10th, Hanover, N. H. 14th, Saint Andrews, N. B.; Orono, Me.; Amherst and Newburyport, Mass.; Berlin Mills, N. H.; and Grantsburgh and Madison, N. H. 14-15th, Green Mountain, Me. 15th, Bar Harbor and Orono, Me.; and Newburyport, Mass. 16th, Kent's Hill, Me.; Pine River Dam, Minn.; and Webster, S. Dak. 17–18th, Sault de Ste. Marie, Mich. 18th, Green Mountain, Me.; Amherst, Mass.; Saint Vincent, Minn.; Hanover, N. H.; and Webster, S. Dak. 19th, Sault de Ste. Marie, Mich.; Huron and Webster, S. Dak. 19–20th, Saint Vincent, Minn. 20th, Alta, Iowa; and Farmington, Minn. 24th, Webster, S. Dak.

Saint Andrews, N. B., 14th: an auroral light of a curtain-like formation was observed from 8.30 to 9.30 p. m.

Green Mountain, Me., 14–15th: a faint aurora consisting of a well-defined arch of white light was observed from 8 p. m., 14th, until morning of 15th. The arch rose to altitude 8°, and extended from azimuth 150° to 215°, with maximum brilliancy about 10 p. m. A similar display both as to time and character was observed on the 18th.

Sault de Ste. Marie, Mich., 17–18th: an aurora consisting of an arch of pale orange color extending from azimuth 175° to 225°, from which beams of light shot up to about altitude 25°, was observed at 9.15 p. m., 17th. The display disappeared about 2.20 a. m., 18th. On the 19th an aurora consisting of a white light which rose to about altitude 20° was observed at 9.45 p. m. The maximum brilliancy of this display occurred about 11.35 p. m., at which time it extended from nw. to ne. At 11.50 p. m. the aurora had disappeared.

Saint Vincent, Minn., 19–20th: an auroral display was observed from 10.10 p. m., 19th, to 1.40 a. m., 20th, consisting of 8 well-defined streamers. The aurora extended from azimuth about 175° to 210° and varied from deep red to pale straw in color. Two streamers located in the centre of the display attained altitude about 60°.

THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms." East of the Rocky Mountains thunder-storms were reported in the greatest number of states, 30, on the 1st, 4th, and 19th; in 20 to 29 on the 2d, 3d, 5th to 10th, 17th, 20th, 21st, and 26th; in 10 to 19 on the 11th to 16th, 18th, 22d, 24th, 25th, and 27th to 30th; and in 5 to 9 on the 23d and 31st.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, 30, in Fla.; on 20 to 28 in Ill., Iowa, Kans., La., Mo., Nebr., N. Y., S. Dak., Tenn., and Tex.; on 10 to 19 in Ala., Ark., Conn., Ga., Ind., Ky., Md., Mass., Mich., Minn., Miss., Mont., N. H., N. J., N. C., N. Dak., Ohio, Pa., S. C., Vt., Va., and Wis.; and on 1 to 9 in D. C., Ind. T., Me., R. I., and W. Va. West of the Rocky Mountains thunder-storms were reported as follows: Ariz., 1st to 31st; Colo., 1st, 4th, 5th, 8th to 20th, 22d, 24th, and 27th; Cal., 5th to 9th, 12th, 13th, 14th, 17th, 21st, and 26th to 29th; Idaho, 8th, 9th, 10th, 13th, 17th, 18th, 20th, 23d to 27th, and 30th; Nev., 5th to 14th, 21st, 22d, 24th, and 27th to 31st; N. Mex., 1st, 2d, 4th, 13th, 15th to 23d, 25th to 28th, and 31st; Oregon, 13th, 14th, 28th, 30th, and 31st; Utah, 8th to 15th, 17th, 18th, 19th, 21st, 22d, 24th, 27th, 29th, 30th, and 31st; Wash., 10th, 18th, 20th, 21st, 29th, 30th, and 31st; Wyo., 2d, 3d, 4th, 9th to 13th, 15th, 16th, 18th, 19th, 21st to 26th, 28th, and 30th. There were no states and territories in which thunder-storms were not reported.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Haverford College Observatory, Pa., (observed by Prof. F. P. Leavenworth):

Date.	Number of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	
Aug., 1890.										
1, 12 m.....	0	11	0	0	0	0	3	22	2	Definition poor; 1 large spot.
2, 5 p. m...	1	1	1	1	0	0	3	4	2	1 large spot.
3, 5 p. m...	0	0	0	0	0	0	1	2	0	Definition bad.
4, 5 p. m...	0	3	0	0	0	0	1	5	1	Definition fine; 1 large spot.
5, 5 p. m...	1	7	0	0	0	0	2	9	1	Definition poor; size medium.
6, 5 p. m...	0	6	0	0	0	0	2	14	1	Definition good.
7, 4 p. m...	0	0	0	0	0	0	2	3	1	
9, 5 p. m...	0	0	0	0	0	0	0	0	1	Definition good.
11, 9 a. m...	1	2	0	0	0	0	1	2	1	Definition fair; size medium.
13, 5 p. m...	0	0	0	0	0	0	0	0	1	Definition fair.
14, 3 p. m...	1	2	0	0	0	0	1	2	1	Definition fair; spots small.
15, 4 p. m...	0	0	0	0	0	0	0	0	0	Definition good.
16, 11 a. m...	1	3	0	0	0	0	1	3	0	Definition poor; spots small.
17, 11 a. m...	0	0	0	0	0	0	0	0	0	Definition good.
18, 3 p. m...	0	0	0	0	0	0	0	0	0	Definition poor.
19, 12 m.....	0	0	0	0	0	0	0	0	1	Definition good.
20, 6 p. m...	0	0	0	0	0	0	0	0	0	Definition fair.
22, 5 p. m...	2	3	0	0	0	0	2	3	1	Definition good; spots small.
24, 4 p. m...	1	5	0	0	0	0	3	8	1	Definition fair; near edge of sun.
25, 3 p. m...	0	14	0	0	0	0	2	21	1	Definition good; 1 large spot.
26, 11 a. m...	0	10	0	0	0	0	1	24	1	Definition poor; large spots.
27, 3 p. m...	0	44	0	0	0	0	2	78	2	Definition good; 1 very large spot.
28, 3 p. m...	0	26	0	8	0	0	2	96	1	Definition good; 2 very large spots
29, 3 p. m...	0	0	1	2	0	0	1	60	0	Definition fair; 2 very large spots.
30, 3 p. m...	0	10	0	0	0	0	1	104	0	Definition good; 2 very large spots
31, 3 p. m...	1	1	0	0	0	0	2	88	0	Definition fair; 2 very large spots.

Mr. C. E. Buzzell, Leaf River, Ill.: the group of July 28th completed the transit, disappearing in faculæ 7th. August 2d prominent faculæ on east limb, which broke out in small spots 5th and subsided 8th. Poor definition and apparently clear disc until 25th, when 2 large groups appeared by rotation, and were on the meridian 31st. September 1st unchanged. These groups occupied the same position as the July 28th disturbance, which, however, had about subsided before passing the western limb.

Mr. John W. James, Riley, Ill.: 2d, spot of July 25th vanished before reaching western edge. 3d, a large spot, estimated 24,200 miles in diameter, was on sun's meridian. 5th, spot breaking up, and gone 8th. 9th to 25th, observations on 14 days, but no spots seen. 26th, a fine group near eastern edge; this group was estimated 94,000 miles long, and had a large spot at each end, 34,200 and 27,400 miles in diameter; each spot was surrounded by numerous small spots, and they were connected by a string of small spots. This group was the finest and sharpest in definition of any seen for years.

Mr. D. E. Hadden, Alta, Iowa: one large spot in north latitude near meridian, 1st. One spot, ne., 2d to 5th. One group and 4 small spots, new, se., 6th. One group and 2 small spots visible, se., 7th. Clear disc and no spots, 8th to 11th, 13th to 19th, 21st and 22d. 23d cloudy. One group and 2 small spots, new, visible 24th. 25th cloudy. One group and 4 spots, new, on 26th; brilliant faculæ near limb, ne.; group on w. limb surrounded by faculæ. 27th, one group, 8 spots, 1 large spot and others small; faint spot, ne., surrounded by faculæ. 28th, 5 spots, new.; one group, 13 spots; one large spot, 3 smaller, others very faint, 3 days in on sw. limb. 29th and 30th, one group, 9 spots; appearance about the same as 28th, but larger spots, separated more.

Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots were observed 2d, 4th, 6th, and 27th to 31st.

DROUGHT.

In Kans., Nebr., S. Dak., Iowa, north Tex., Ind. T., Ky., Ill., and south Mich. the drought was broken by rain during the early part of the month, and in Ohio the rains of the middle of the month ended the dry spell in that region. In S. Dak. late crops were reported injured. In southwest Minn. the drought was very severe and streams were reported very low. In Ohio great injury was caused to corn, potatoes, and fruit. In southern Mich. potatoes, fruit, and berries were affected. In east and central Va. the month was unusually dry, and corn and vegetation were damaged.

PRAIRIE FIRES.

Prairie fires caused considerable damage in parts of Mont. and S. Dak., in Ford and Edwards counties, Kans., and in McCulloch Co., Tex.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for August, 1890, were made by Captain H. H. C. Dunwoody, 4th Artillery, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

Percentages of forecasts verified, August, 1890.

States.		States.	
Maine	80.1	Kentucky	83.6
New Hampshire	82.7	Ohio	86.5
Vermont	82.8	West Virginia	78.4
Massachusetts	83.8	Indiana	84.9
Rhode Island	84.4	Illinois	88.3
Connecticut	75.9	Lower Michigan	86.1
Eastern New York	80.1	Upper Michigan	79.0
Western New York	84.5	Wisconsin	84.4
Eastern Pennsylvania	85.9	Minnesota	82.1
Western Pennsylvania	83.7	Iowa	80.1
New Jersey	83.3	Kansas	84.0
Delaware	83.7	Nebraska	82.4
Maryland	82.1	Missouri	85.8
District of Columbia	81.7	Colorado	85.1
Virginia	84.9	North Dakota	83.9
North Carolina	84.6	South Dakota	77.0
South Carolina	82.2	Southern California*	89.8
Georgia	87.2	Northern California*	90.2
Eastern Florida	93.6	Oregon*	85.7
Western Florida	85.0	Washington*	87.3
Alabama	89.6	*By elements:* Weather	86.0
Mississippi	87.7	Temperature†	81.5
Louisiana	88.9		
Texas	90.6	Monthly percentage of weather and temperature combined‡	84.2
Arkansas	87.4		
Tennessee	86.8		

*In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. †The forecasts of temperature in districts east of the Rocky Mountains for August, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the 2d and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 18; temperature, 26. Percentages of verifications: weather, 58.1; temperature, 65.4; weather and temperature combined, 61.8.

No forecasts for 72 hours were made during the month.

CAUTIONARY SIGNALS FOR AUGUST, 1890.

Statement showing percentages of justifications of wind signals for the month of August, 1890:

Wind signals.—(Ordered by Captain H. H. C. Dunwoody.) Total number of signals ordered, 51, of which 32 were justified as to velocity, and all as to direction. Of the signals ordered, 50 were cautionary signals, of which 31 were justified, and one was a storm signal which was justified. 11 signals were ordered for easterly winds, and 40 for westerly winds, all of which were justified. Percentage of justifications, 62.5.

No cold-wave signals were ordered during the month.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for August, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	85.6	87.3	Nebraska	80.6	89.0
Iowa	81.6	93.2	New Jersey	75.9	85.8
Louisiana, northern	88.0	96.0	North and South Dakota	92.0	92.0
Louisiana, southern	79.0	92.0	Ohio	84.0	88.0
Minnesota	69.0	73.0	Pennsylvania	82.0	85.0
Missouri	85.0	87.0	South Carolina	94.5	79.1

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for August, 1890, of the directors of the various state weather services:

ALABAMA.

The weather was unfavorable to the cotton crop, as it favored the development of rust, which caused considerable damage.

Temperature.—Highest monthly mean, 80, at Livingston; lowest monthly mean, 72.1, at Chepultepec; maximum, 97, at Eufaula, 7th, and at Marion, 27th; minimum, 50, at Florence, 28d, and at Double Springs, 31st.

Precipitation.—Greatest monthly, 7.30, at Florence; least monthly, 0.07, at Pine Apple.

Wind.—Prevailing direction, southwest.—*Prof. P. H. Mell, Auburn, director; J. M. Quarles, Private, Signal Corps, assistant.*

ARKANSAS.

Temperature.—The mean was about 2.0 above the normal; maximum, 104, at Lead Hill, 8th; minimum, 50, at Forrest City, 13th; greatest local monthly range, 46, at Lead Hill; least local monthly range, 19, at Winslow.

Precipitation.—The average was about 0.36 above the normal; greatest monthly, 10.52, at Winslow; least monthly, 0.15, at Malvern.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—The mean was 4.0 above the average for the last 4 years; highest monthly mean, 76.7, at Lamar; lowest monthly mean, 48.9, at Climax; maximum, 104, at Bennet, 6th, and at First View, 7th; minimum, 24, at Alma, 25th; greatest local monthly range, 66, at Julesburg; least local monthly range, 30, at Cumbres.

Precipitation.—The rainfall was 0.10 above the average for the last 4 years; the amount ranged from 5.41, at Watervale, to trace, at Westcliffe.

Wind.—Prevailing direction, west.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Sergeant, Signal Corps, assistant.*

ILLINOIS.

Temperature.—The mean was 2.8 below the normal of the past 15 years; maximum, 104, at Atwood, East Peoria, and Pontiac, 3d; minimum, 40, at Aurora, 23d.

Precipitation.—The average was 0.36 below the normal of the last 12 years; greatest monthly, 7.06, at Jordan's Grove; least monthly, 0.95, at Collinsville.